INTRODUCTION AND OVERVIEW CHAPTER 1

The EPA Office of Solid Waste and Emergency Response (OSWER) is developing a framework for characterizing and analyzing the costs and benefits (including environmental, health, and other human welfare benefits) and other impacts of its various environmental programs. In the first step this effort, OSWER identified a comprehensive set of program attributes that describe a broad range of potential impacts that may result from OSWER programs.[1] This report represents the second step of this initiative, which is to develop potential methods OSWER could use to qualitatively or quantitatively characterize those attributes.

OSWER expects that the results of implementing the methods described in this report would be reviewed and used by both internal EPA managers as well as external stakeholders with an interest in the OSWER program performance. To this end, OSWER has identified among its attributes some benefit/cost categories that are still evolving and being actively debated in economic circles (e.g., sustainability), but are nevertheless important to those trying to gain an understanding of program impacts. In addition, OSWER believed it was important to go beyond the attributes typically considered in a traditional benefit/cost analysis to characterize and describe other program features and factors that influence the design, implementation, performance, and impacts of OSWER programs. The results of implementing the methods in this report, therefore, are intended to provide a broad-based program assessment, rather than just a traditional benefit/cost analysis.

OSWER selected two programs to serve as pilots to test the practical application of these attributes in characterizing and measuring program impacts: the Resource Conservation and Recovery Act (RCRA) Subtitle C prevention and waste minimization program, and the Underground Storage Tank (UST) cleanup program. As part of this pilot, Industrial Economics, Incorporated (IEc) is developing a range of potential methods (from relatively simple to more complex) for characterizing and/or quantifying the OSWER attributes that are relevant to each of these programs.

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[1] See Henry Roman, Thomas Walker, and Dr. Kimberly Thompson, *Risk, Cost, and Benefit Attributes for OSWER*, an unpublished memorandum prepared for EPA OSWER Comparative Risk Group, Office of Solid Waste and Emergency Response, December 31, 1998, and Exhibit 1-1 in this chapter.

The purpose of this report is to present the proposed methodologies we have developed for assessing the benefits, costs, distributional impacts, and other key features of the RCRA Subtitle C and waste minimization program. We also describe the advantages, disadvantages, and data requirements associated with the different methods.[2] Based on OSWER direction, we focused on development of methods for performing a retrospective analysis of the RCRA program.

1.1 BACKGROUND

The RCRA Subtitle C program governs practices related to the generation, management, and disposal of hazardous wastes. A series of RCRA regulations issued by EPA since 1980 have established a broad range of technical, tracking and reporting requirements for facilities that generate or manage hazardous waste. These requirements establish a far-reaching, "cradle-to-grave" system of regulations whose purpose is to assure that wastes, once generated, are properly treated, stored, transported, and disposed of in facilities that are protective of human health and the environment. All facilities generating or managing significant amounts of hazardous waste must obtain permits, meet technical specifications for waste management, comply with an extensive manifest system that tracks the transport and disposal of waste, and employ inspection and monitoring systems to prevent damage from accidental releases. In addition, the regulations prohibit land-based disposal for certain wastes, restrict facility siting in flood plains and other sensitive areas, and contain financial assurance provisions to guarantee that facilities will be able to properly address accidents and close down waste management units.

The RCRA waste minimization program also coordinates initiatives to induce industry to reduce the both the overall amount and toxicity (i.e., the quantity of persistent, bioaccumulative, and toxic constituents) of hazardous waste that is generated. These initiatives may produce benefits in the form of cost savings that accrue to industry for managing smaller quantities of waste; risk reductions because a smaller quantity of waste is managed; and potential reductions in cross-media transfer, non-compliance-related risk, and demand for landfill space.[3]

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[2] This memorandum is submitted under Task 3 of Work Assignment 2-37, EMRAD Contract 68-W6-0061. The Underground Storage Tank Cleanup Program methodologies are described in a separate memorandum under Task 2 of Work Assignment 2-37.

[3] Even when hazardous wastes are stringently regulated and managed, they may sometimes pose environmental concerns. Accidents during handling and transportation of hazardous wastes, for example, can result in releases to the environment or unexpected occupational exposures. In addition, waste minimization helps reduce risks from constituents that are difficult to manage using certain practices (e.g., metals, which are not destroyed by combustion and remain potentially available to the environment).

In 1996, OSWER initiated an effort aimed at improving its ability to characterize and communicate past and future program accomplishments and to improve decision making and strategic planning. This effort was prompted in part by recent calls for increased use of risk-based priority setting, benefit-cost analysis, and comparative risk analysis in EPA decision-making. OSWER has developed a comprehensive set of attributes that would represent the broad range of benefits, costs and distributional impacts that could apply to all OSWER programs and activities. Exhibit 1-1 lists these attributes.

Exhibit 1-1 presents OSWER's attributes in four general categories: Social Benefits, Social Costs, Distributional Impacts, and Program Context Attributes. The first two categories (i.e., Social Benefits and Social Costs) include those attributes that measure net economic benefits and costs associated with specific program results. Distributional impact attributes, in contrast, are not additive to the benefits and costs, but are instead metrics for identifying the allocation of costs and benefits of the regulation throughout society, and examining "who" in society is recipient of positive and negative impacts of the regulation. While distributional impacts do not represent net benefits or costs, they frequently identify results important to policy-makers.

The fourth category (Program Context Attributes) is a diverse set of attributes. This category includes some attributes that might represent net benefits (e.g., long-term behavioral change), but are difficult or impossible to measure, or difficult to isolate from other benefit and cost categories. Others are factors (e.g., stakeholder issues, legal constraints) or program initiatives (e.g., regulatory reinvention initiatives) that affect program performance and therefore might be important to policy-makers, but are not themselves measurable as benefits or costs.

This broad set of attributes is a "starting point" for OSWER programs to use in identifying potentially relevant attributes. The list serves as a menu from which program managers can select those attributes that most meaningfully contribute to characterizing the benefits, costs, and distributional impacts of their programs. Methods can then be developed for measuring those particular attributes.[4] It is hoped that at least some of the methods that are developed for one program could be useful in whole or in part to another OSWER program trying to measure that same attribute.

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[4] Exhibit 1-1 contains several attributes and examples that may potentially double-count certain benefits and costs, or may be addressed as real costs or benefits in a traditional benefit-cost analysis, and may also be addressed in a distributional analysis or a discussion of program context attributes. For example, transitional social costs such as job losses could represent real costs (or real gains, if a regulation resulted in new jobs). In addition, both job losses and job gains in different regions or industry sectors could be examined as distributional impacts of a regulatory program. In developing and implementing approaches to assessing specific programs policy-makers should carefully address issues of double-counting.

OSWER selected its RCRA Subtitle C and hazardous waste minimization program to serve as a pilot study for developing methods suitable for evaluating and communicating the performance of OSWER prevention-based programs. A parallel pilot study of the Underground Storage Tank cleanup program is addressing methods related to remediation of contaminant releases.

As a first step in the Subtitle C pilot, RCRA program staff selected from Exhibit 1-1 those attributes that, based on their experience, seemed most relevant to characterizing the benefits, costs, and distributional impacts of the prevention program. The purpose of this report is to identify and develop potential methods for characterizing and measuring those attributes; identify data and information requirements associated with those methods; determine data availability from federal, state, and local agencies and private sources; and discuss the advantages and disadvantages associated with the different methodological options. For benefits, costs, and distributional impacts, the report also considers an explicit long-term effects category. This category focuses on effects in future generations, an area of considerable importance to the Subtitle C program.

The methods are also expected to support OSWER's reporting under the Government Performance and Results Act (GPRA), which requires government agencies to develop methods for assessing the goals and performance of their programs. For the RCRA Subtitle C and hazardous waste minimization programs, the current long-term GPRA subobjectives are, respectively:

- By 2005, at least 85 percent of hazardous waste management facilities located in the United States, its territories, or on tribal lands will have permits or approved controls in place to prevent dangerous releases to air, soil, and groundwater.

- By 2005, reduce by 50 percent from 1991 levels the volume of priority persistent, bioaccumulative, and toxic (PBT) wastes in hazardous waste streams (to be listed by EPA in FY 2000) through voluntary partnerships and pollution prevention initiatives.

In Chapter 8 we discuss how the proposed methods can contribute to characterizing the impacts of the Subtitle C and hazardous waste minimization programs to support OSWER's GPRA performance reporting.

Exhibit 1-1

OSWER ATTRIBUTES MATRIX

Attribute Category	Attributes
SOCIAL BENEFITS	
Human Health Benefits	
Individual Risk	1. Mortality Reduction - Examples: • Reduced risk of cancer fatality • Reduced risk of acute fatality 2. Morbidity Reduction - Examples: • Reduced risk of cancer • Reduced risk of asthma • Reduced risk of nausea • Reduced risk of acute health effects and injuries
Population Risk	
Ecological Benefits	
Market Ecological Values	Examples: 1. Commercial fisheries 2. Monetized recreational benefits 3. Food 4. Fuel 5. Fiber 6. Timber 7. Fur/leather
Non-Market Ecological Values and Amenities	Examples: 1. Recreational enjoyment 2. Non-use values: existence, bequest, and quasi-option values
Indirect Ecosystem and Resource Conservation Impacts	Examples: 1. Climate moderation 2. Flood moderation 3. Groundwater recharge 4. Sediment trapping 5. Soil retention 6. Nutrient cycling 7. Pollination by wild species 8. Biodiversity 9. Water filtration 10. Soil fertilization 11. Pest control 12. Reduced pressure on endangered species 13. Avoided habitat destruction
Avoided Costs	Examples: 1. Avoided costs of providing government mandated alternate drinking water supplies 2. Avoided costs associated with government mandated cleanups of chemical accidents or spills
Avoided Materials Damages, Improved Aesthetics and Historical Preservation	Examples: 1. Aesthetic pleasure 2. Improved taste, odor, visibility 3. Protection of resources with cultural and historic value 4. Protection of constructed resources (e.g., buildings, infrastructure)

Exhibit 1-1

OSWER ATTRIBUTES MATRIX

Potential Long-Term Benefits (Sustainability)	Examples: 1. Avoided increases in damages related to changes in affected populations 2. Benefits associated with resource conservation 3. Benefits associated with the precautionary principle: protection from unforeseen issues 4. Benefits from long-term increases in the value of environmental quality
SOCIAL COSTS	
Compliance Costs	Examples: 1. Capital costs of new or retrofitted equipment 2. Operation and maintenance of new or retrofitted equipment 3. Waste capture and disposal 4. Changes in production processes or inputs 5. Maintenance changes in other equipment
Regulatory Costs (Government Sector)	Examples: 1. Training/administration 2. Monitoring/reporting 3. Enforcement/litigation 4. Permitting
Social Welfare Losses	Examples: 1. Higher consumer and producer prices 2. Legal/administrative costs
Transitional Social Costs	Examples: 1. Unemployment 2. Firm closings 3. Transaction costs 4. Disrupted production
Long-term Costs	Examples: 1. Potential failure to benefit from technology advances, decreases in cost 2. Potential failure to invest in more productive activities
DISTRIBUTIONAL IMPACTS	
Equity Effects	Examples: 1. Public/private distribution of costs 2. Enforcement of "polluter pays" principle 3. Environmental Justice and impacts on sensitive sub-populations 4. Inter-generational equity
Economic Impacts Positive	Examples: 1. Job creation/support 2. Increased tax revenue 3. Small business cost savings 4. Small government and non-profit cost savings
Negative	Examples: 1. Job losses 2. Plant closures 3. Small business closures 4. Negative impacts on small governments and non-profits

Exhibit 1-1

OSWER ATTRIBUTES MATRIX

Risk Tradeoffs	Major risk increases or transfers: 1. Risk of worker exposures or accidents during response 2. Risk to neighbors during cleanup 3. Risks from transport & disposal of hazardous waste 4. Risks from substitutions of untested compounds for PB&T compounds as part of waste minimization effort
PROGRAM CONTEXT ATTRIBUTES	
Constraints	Legal/Statutory requirements: 1. Statutory mandates 2. Court orders 3. Budget riders 4. Threat of legal action
Stakeholder Issues	Examples: 1. Intensity of feeling (program addresses a problem for which there is high stakeholder interest; incorporates public's "dread") 2. Value of information systems, providing information to stakeholders 3. Empowers co-implementors (e.g., Tribes, states)
Other Program Context Attributes	Examples: 1. Technology forcing 2. Long-term behavioral change 3. "Streamlining:" increased efficiency and cost-effectiveness of site cleanup and redevelopment 4. Leveraged private/public investment 5. Supports EPA reinvention initiatives not otherwise listed in this matrix (e.g., paperwork reduction) 6. Other _____

Source: Industrial Economics, *Risk, Cost, and Benefit Attributes for OWSER*, an unpublished memorandum prepared for EPA's Office of Solid Waste and Emergency Response, December 31, 1998, as modified to reflect information in EPA's *Guidelines for Preparing Economic Analyses*, Environmental Protection Agency Science Advisory Board Review Draft, June 11, 1999.

1.2 SCOPE OF THE RCRA SUBTITLE C ANALYSIS

This report identifies methodologies that address the effects of changes in hazardous waste generation and management under existing RCRA Subtitle C prevention programs. We define the scope of our analysis as follows:

RCRA Hazardous Waste: Our analysis focuses on Subtitle C prevention programs that establish and govern practices for the proper generation, management, and disposal of hazardous wastes. This includes all listed and characteristic wastes addressed under Subtitle C of RCRA in any of its rule-makings. However, we do not address regulations governing RCRA Subtitle D industrial or municipal wastes, or the use and disposal of toxic or hazardous materials that are not governed under RCRA. Toxic materials outside the scope of this analysis include non-waste materials regulated under separate statutes such as the Toxic Substances Control Act (TSCA), and certain

materials regulated as hazardous or toxic by other federal agencies such as the Department of Transportation.

Prevention Activities: Our proposed methods address activities related to the prevention of improper waste disposal, and do not address activities related to the cleanup or remediation of existing hazardous waste sites.[5] In other words, we do not address the costs and benefits of activities under RCRA's Subpart S Corrective Action program or under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Also, while we recognize that immediate response actions required as part of monitoring under RCRA can reasonably be considered prevention activities in that they can prevent releases from causing environmental damage, we have not yet isolated the costs of immediate response activities or determined their contribution to the program. We recommend that this issue be addressed before a complete analysis of RCRA is undertaken.

Retrospective Analysis: We present methodologies for developing a retrospective analysis of the RCRA program. That is, we examine only waste generation and disposal that has taken place prior to year 2000, and do not attempt to include benefits from future developments in waste management. We also remove from consideration impacts associated with management and disposal of waste prior to the implementation of RCRA regulations (i.e., before 1980). However, we do consider future releases and damage that may result from past and current "with-RCRA" waste generation and management practices (i.e., from 1980 to 2000) in calculating benefits, as well as the potential current and future damage that would have occurred in the absence of the regulation.

1.3 WITH-RCRA AND WITHOUT-RCRA SCENARIOS

To identify and evaluate the changes in practice that have resulted from the RCRA Subtitle C program, we define two scenarios: a baseline "without-RCRA" scenario and an actual "with-RCRA" scenario. The without-RCRA baseline estimates the effects of the hypothetical continuation of pre-RCRA waste management practices in the absence of the prevention program. Our without-RCRA scenario assumes that RCRA Subtitle C programs do not exist in any form; we remove both the prevention and the Corrective Action programs from consideration in this scenario. However, the "without-RCRA scenario" does assume the existence of the Superfund program under CERCLA; this program primarily implements hazardous waste remediation at "closed" or inactive facilities.

Note that while we assume that the Superfund program exists and addresses past contamination incidents, our without-RCRA scenario does not assume that remediation occurs at

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[5] We use the term "hazardous waste site" to describe a hypothetical site that would require cleanup under state or federal hazardous waste programs (e.g., Superfund). However, the term is not intended to describe a site of particular size, or to designate a site governed by a particular regulatory program.

active facilities or sites, or that remediation addresses post-1980 spills. Instead, we make the simplifying assumption that Superfund (and Subpart S Correction Action) addresses the remediation of contaminated sites existing in 1980 and RCRA Subtitle C, starting in 1980, addresses all post-1980 contamination associated with active facilities (i.e., through prevention and response requirements). We do not attempt to predict the application of the Superfund program to active sites in the absence of RCRA, or to identify prevention measures taken by facilities to avoid Superfund liability. In reality it is unlikely that either RCRA or Superfund (or state programs) could "take credit" for all prevention-related benefits, but we are unable to isolate the effects of specific programs.[6]

Our with-RCRA scenario reflects the generation and management of hazardous waste in the presence of all RCRA Subtitle C and state (RCRA-equivalent) hazardous waste prevention programs. This scenario includes existing and future environmental damage from hazardous waste management and disposal that took place before 1980 (i.e., damage that was not avoided by RCRA regulations). The "with-RCRA" facility population and waste management practices are represented by reporting data in the Biennial Reporting System (BRS) and by information in Resource Conservation and Recovery Information System (RCRIS), a database that combines several earlier EPA databases with information about facilities that generate and manage hazardous waste.

We make two simplifying assumptions at this stage of our methodology development. First, we assume that there is 100 percent compliance with all regulations included in the scenarios.[7] Second, we focus on facilities regulated under federal programs, and do not specifically address the contribution of state programs in either the baseline or the without-RCRA scenarios. However, a complete analysis of RCRA benefits and costs should consider both the effects non-compliance and the effects of activities under "RCRA-inspired" state hazardous waste programs. We address these issues in more detail in our discussion of further analysis in Chapter 8.

It is important to note, however, that because the purpose of this report is to present a preliminary range of methodologies for characterizing the RCRA Subtitle C program, we have focused on detailing those assumptions that are most critical for this early stage of option evaluation.

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[6] Note that it is possible to incorporate remediation into a without-RCRA scenario; doing so would require that both the avoided costs and benefits associated with remediation be incorporated into the benefits estimate.

[7] Section 5.3.2 of EPA's *Guidelines for Preparing Economic Analyses* suggests that it is reasonable in most cases for analysts to assume total compliance with regulatory scenarios. However we suggest a sensitivity analysis to address the potential effects of non-compliance with RCRA Subtitle C regulations, because the costs associated with hazardous waste management may provide considerable economic incentives for illegal waste disposal. See also *Guidelines for Preparing Economic Analyses,* Science Advisory Board Review Draft, US Environmental Protection Agency, June 11, 1999.

There are additional assumptions and design details that would need to be developed if a particular approach is selected for implementation, but we do not attempt to address all of the design and implementation issues at this time.

1.4 SUMMARY OF CHANGES IN WASTE GENERATION AND MANAGEMENT EXPECTED UNDER RCRA

The RCRA Subtitle C prevention program mandated large-scale changes in behavior that are, in turn, associated with improvements in the quality of human health and the environment. The general benefits of the program are associated with the following changes:

- **Closure/conversion of treatment, storage, and disposal (TSD) facilities with pre-RCRA hazardous waste management practices.** A reduction in the number of low quality TSD facilities results in fewer sites with the potential for spills, accidents, and environmental damage.

- **Improved waste management practices at TSDs.** The improvement of waste management practices at existing TSDs results in fewer releases that may cause environmental damage, and improved practices for addressing the handling of waste and waste releases.

- **Closure/conversion of facilities generating hazardous waste.** A reduction in the number of hazardous waste generators results in fewer sites with the potential for spills, accidents, and environmental damage.

- **Improved waste management practices at generator and transporter facilities.** Improved storage, container, and transport manifest practices at facilities that generate hazardous waste results in fewer accidental releases and fewer incidents of improper waste disposal.[8]

- **Reduction in waste quantities generated.** A reduction in the quantity of hazardous waste generated reduces the overall risk of environmental damage from the release of hazardous wastes.

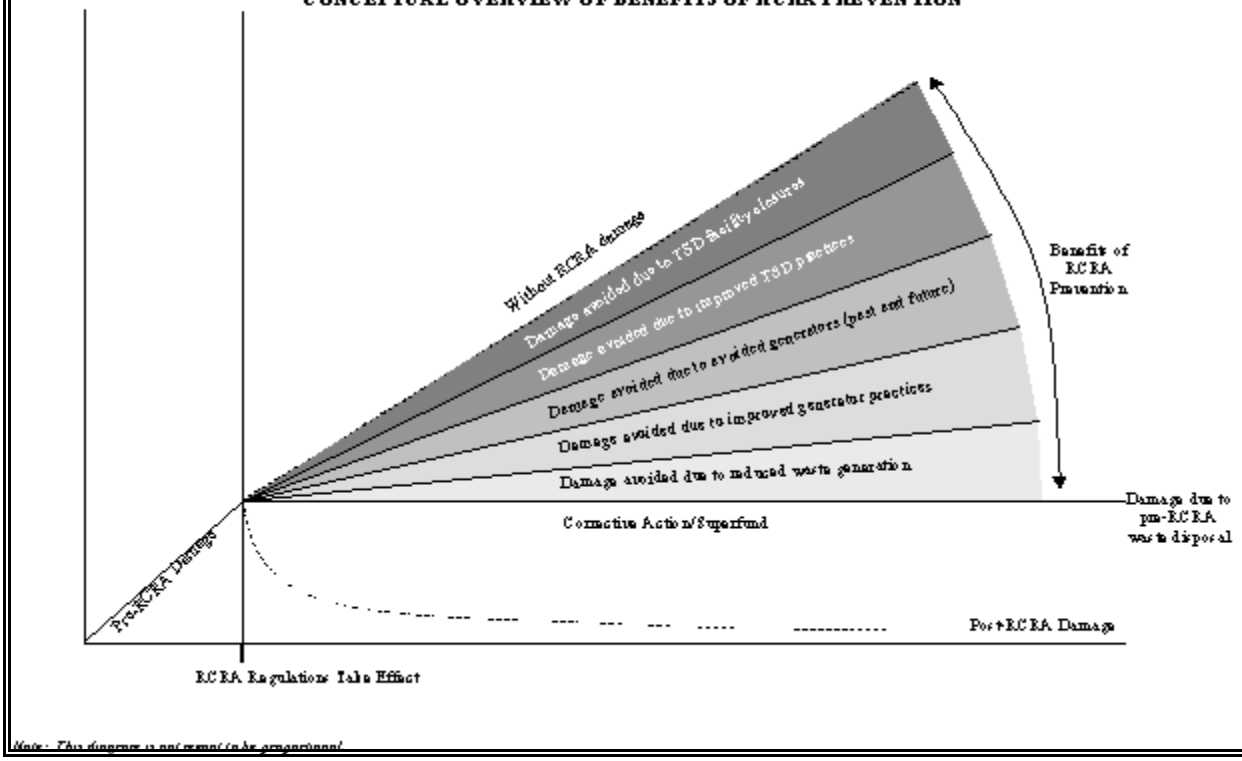
Each of these changes in behavior may have a wide range of associated impacts (or attributes) that describe its overall effects on the environment and economy. Benefits include reductions in human health and ecological risk, avoided costs associated with remediation and treatment of health effects, and long-term benefits such as the preservation of resources for future

[8] This category of benefits is the one most likely to be affected by rates of non-compliance.

generations. In addition, changes under RCRA increase compliance costs, and may have local and national economic impacts such as changes in employment opportunities and technological development, distributional shifts in environmental and economic equity, and possible additional risks associated with changes in transportation or waste handling. While it is not possible to establish the relative magnitude of the benefits associated with each of these changes in behavior, Exhibit 1-2 provides a conceptual overview of the potential benefits of the RCRA prevention program.

Exhibit 1-2

CONCEPTUAL OVERVIEW OF BENEFITS OF RCRA PREVENTION



1.5 APPROACHES TO MEASURING RCRA ATTRIBUTES

We present four general approaches to developing an estimate of the benefits of RCRA. The Property Value Estimate (Approach A, described in detail in Chapter 2) is a simplified approach that provides a single property value-based monetary estimate of the benefits associated with avoiding contaminated sites due to the closure of pre-RCRA TSDs. The estimate of avoided property value loss presents a combined "market value" for a number of benefits attributes, though no individual attribute is specifically measured. This approach is limited in both specificity and scope; it considers only the benefits and impacts of facility closures and avoided hazardous waste sites. However, it

is not particularly resource intensive relative to other proposed options; a limited number of available data sources are required to establish a program-wide estimate.

Chapter 3 presents three distinct approaches that aim to develop more specific descriptions of human health, ecological, and other benefits. All of these approaches incorporate the use of pathway modeling to describe human health and ecological impacts of RCRA regulations, though the approaches differ both in required data and in modeling approaches. Approach B is based on site-specific facility modeling, and uses facility and modeling data collected for the sample of facilities studied in the *Draft Regulatory Impact Analysis for the Final Rulemaking on Corrective Action for Solid Waste Management Units* (*Corrective Action RIA*), while Approach C describes a new sample selection and modeling effort tailored to a specific RCRA prevention analysis. Finally, Approach D estimates changes in waste management by key industries and uses pathway modeling to measure the effects of these changes at a hypothetical distribution of unregulated facilities. These approaches estimate the value of improved waste management and disposal practices at TSDs, including both the incremental benefits of improved management practices at operating TSDs and the value of avoided hazardous waste sites due to facility closures and conversions.

The remaining chapters of this report address benefits, costs, and impacts not captured in the general benefits approaches. Chapter 4 discusses potential long-term benefits that are not captured by the other approaches and are difficult to value economically. Chapter 5 presents two alternative approaches to assessing program costs. In Chapter 6 we address the distributional impacts of the RCRA program, attributes that are not adequately addressed in an analysis of net economic benefits. These attributes include inter-generational equity, economic equity, and environmental justice, as well as the impacts of RCRA on the economy and production and potential risk tradeoffs (increases in risk that result from the regulation). Chapter 7 identifies methods for addressing Program Context Attributes that describe the constraints and policy priorities that help determine program activities and effects. Finally, in Chapter 8 we summarize the approaches, identify the limitations associated with each, and note additional analyses that may contribute to a more comprehensive program analysis. We also discuss how the approaches might assist the RCRA program in its GPRA reporting. Appendix A is a review of property value literature. Appendix B contains a table summarizing all of the methods discussed in this report, along with their data requirements, advantages, and disadvantages. We strongly recommend that readers refer to and use Appendix B as they read through the chapters of this report because it provides a concise summary of the methods and facilitates comparing and contrasting the methods.

Exhibit 1-3 presents an outline of the approaches we present, and identifies the attributes selected by the RCRA program (from Exhibit 1-1) as the most relevant for characterizing the benefits, costs, and distributional impacts of the RCRA Subtitle C program. The exhibit briefly describes the alternative approaches to analyzing benefits, and then lists the relevant attributes that must be addressed separately under all approaches.

Exhibit 1-3

SUMMARY OF ATTRIBUTES ADDRESSED BY ANALYTIC APPROACHES

<table>
<tr><th colspan="2">BENEFITS</th></tr>
<tr><th>APPROACH A: Property Value Estimate</th><th>APPROACHES B, C, and D: Modeling Approaches</th></tr>
<tr><td rowspan="4">Estimate includes aggregate analysis of the following attributes as revealed in residential property value effects of proximity to hazardous waste sites.

Human Health Benefits from reduction in the number of hazardous waste sites requiring cleanup.

Ecological Benefits from avoided releases to air, land and water.

Avoided Costs of government mandated site remediation, and other responses to hazardous waste exposure.

Improved Aesthetics and Historic Preservation Benefits due to removal of "noxious" facilities and practices.</td><td>Estimates of specific benefits based on exposure modeling; includes separate analyses of the following four benefits attributes. *

Human Health Benefits due to avoided releases of waste from improper disposal. Includes individual cancer, non-cancer risk reduction, population/monetized fatalities, injuries, disease case reduction, population threshold exceedance reduction.</td></tr>
<tr><td>Ecological Benefits due to avoided releases of waste from improper disposal. Based on pathway modeling of areas near sample facilities.</td></tr>
<tr><td>Avoided Costs of government mandated water treatment.</td></tr>
<tr><td>Improved Aesthetics and Historic Preservation Benefits due to removal of "noxious" facilities and practices.</td></tr>
<tr><td colspan="2">Potential Long-Term Benefits (Sustainability) including potential benefits associated with avoided long term damage, avoided increases in damage related to changes in exposed populations, avoided unforeseen damages, and future changes in the values society may place on avoiding risks or ensuring environmental quality.</td></tr>
<tr><th colspan="2">COSTS</th></tr>
<tr><td colspan="2">Costs, including compliance costs and government regulatory costs related to RCRA hazardous waste management.</td></tr>
<tr><td colspan="2">Potential Long-Term Costs, including incremental costs associated with technology changes and social costs associated with reductions in alternative investments.</td></tr>
<tr><th colspan="2">DISTRIBUTIONAL IMPACTS</th></tr>
<tr><td colspan="2">Intra-Generational Economic Equity Impacts due to better public/private cost distribution and improved emphasis on the "polluter pays" principle.</td></tr>
<tr><td colspan="2">Environmental Justice Impacts due to closure of pre-RCRA facilities and/or siting of new Subtitle C TSDs in areas with disadvantaged populations.</td></tr>
<tr><td colspan="2">Economic Impacts due to plant closures, new jobs related to changes in waste management practices.</td></tr>
<tr><td colspan="2">Risk Tradeoffs, including risks from management, transport, and disposal of hazardous waste, and risks from substitution of untested compounds for persistent, bioaccumulative, and toxic (PBT) compounds as part of waste minimization efforts.</td></tr>
<tr><td colspan="2">Long-Term Impacts: Inter-Generational Equity, addressing the occurrence of costs and benefits in different generations</td></tr>
<tr><th colspan="2">PROGRAM CONTEXT ATTRIBUTES</th></tr>
<tr><td colspan="2">EPA Reinvention Initiatives, including improved cost-effectiveness of regulatory programs</td></tr>
<tr><td colspan="2">Constraints on regulatory cost effectiveness, including statutory mandates, court orders, budget riders, threat of legal action.</td></tr>
<tr><td colspan="2">Technology Forcing characteristics (i.e., improvements in treatment technology as a result of new treatment standards).</td></tr>
<tr><td colspan="2">Stakeholder Issues that define program priorities, including intensity of feeling, value of information systems and providing information to stakeholders, and empowerment of co-implementers such as states.</td></tr>
<tr><td colspan="2">Long-Term Effects: Behavioral Change that is associated with waste management practices developed under the program.</td></tr>
<tr><td colspan="2">* The ability to extrapolate to national results in Approaches B, C, and D will depend on the representativeness of the sample and the level of available Agency resources. Depending on the level of resources available, the approach may range from a limited number of detailed case studies to a more extensive representative sample of facilities.</td></tr>
</table>